STATE OF ALASKA DOT&PF

MATERIAL SITE INVENTORY
STATUS & INSPECTION REPORTS

NORTHERN REGION

RICHARDSON HIGHWAY

VOLUME 4 OF 5

PRIMARY ROUTE NO. 62

DELTA JUNCTION (MP 266)
TO FAIRBANKS (MP 362)

FEDERAL PROJECT NO. STP-000S(530)
AKSAS PROJECT NO. 76174

ALASKA DEPARTMENT OF TRANSPORTATION
& PUBLIC FACILITIES
5800 East Tudor Road
Anchorage, Alaska 99507-1286

Prepared by:

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March, 2010

STATEWIDE MATERIAL SITE INVENTORY

LIMITATIONS

The discussions of material site conditions presented in these reports has been based on the pertinent information listed herein and are intended to be used for planning purposes only. The information contained should be verified prior to use for design or construction purposes. To be sure of comprehensiveness, please check with State of Alaska DOT&PF materials staff for updated information. Every reasonable effort has been made to assure the accuracy of the maps and associated data. However, the State of Alaska DOT&PF makes no warranty, representation or guaranty as to the content, sequence, accuracy, timeliness or completeness of any of the data provided herein. The State of Alaska DOT&PF explicitly disclaims any representations and warranties, including, without limitation, the implied warranties of merchantability and fitness for a particular purpose. The State of Alaska shall assume no liability for any errors, omissions, or inaccuracies in the information provided regardless of how caused. The State of Alaska DOT&PF shall assume no liability for any decisions made or actions taken or not taken by the user of the applications in reliance upon any information or data furnished hereunder.

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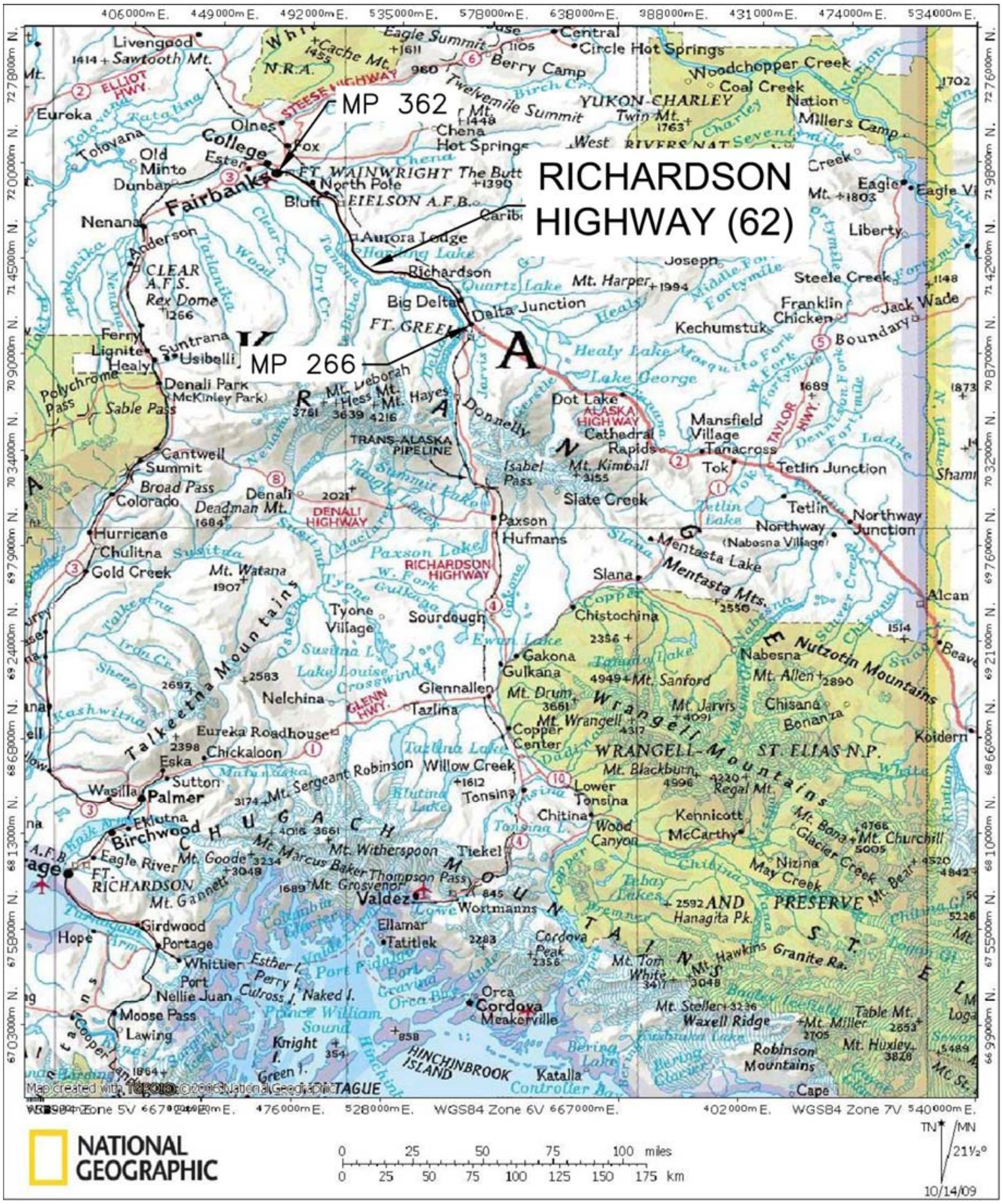

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RICHARDSON HIGHWAY

PRIMARY ROUTE NO. 62
DELTA JUNCTION (MP 266) TO FAIRBANKS (MP 362)

1.0 MATERIAL SITE NUMBERING

Alaska Department of Transportation and Public Facilities (DOT&PF) material site numbers for the Richardson Highway were generally assigned using the following format.

The primary route number 62 is used for material sites along the Alaska Highway from the Canadian Border to Delta Junction and along the Richardson Highway between Delta Junction and Fairbanks. The primary route number 71 is used for material sites along the portion of the Richardson Highway south of Delta Junction.

For primary or interstate route system coding, i.e. 62-1-001-5:

- The first two digits represent the Primary Federal Aid Route Number, for the Alaska/Richardson Highway this number is 62.

- The third digit represents the control section of the route. The Alaska/Richardson Highway is divided into four sections as follows:

    1. Canadian Border to Tetlin Junction
    2. Tetlin Junction to the Johnson River
    3. Johnson River to Shaw Creek
    4. Shaw Creek to Fairbanks

    These sections appear to have varied over the years and there is some overlap between Sections 2 and 3.

- The 4^{th}, 5^{th} and 6^{th} digits are the assigned site number.

- The last digit is the region in which the site is located. Along the Alaska Highway both 2 and 5 are used due to past changes in the region boundaries.

2.0 GEOLOGIC SETTING

The following information is general in nature and is intended to provide those who are unfamiliar with the area with a general description of the geology, and how it relates to material sites. This information is not intended to be complete. More detailed investigations should be performed before decisions are made on individual material sites.

2.1 Location

This inventory area lies along the Richardson Highway corridor between Milepost (MP) 266 at Delta Junction and MP 362 at Fairbanks, a distance of approximately 96 miles. The road terminates in Fairbanks (MP 362) at the junction of the Steese Highway, Richardson Highway, Fort Wainwright Main Gate and Airport Road. Two small cities, Delta Junction (MP 266) and North Pole (MP 349) and several small named settlements and lodges including Big Delta, Shaw Creek, Richardson, Midway, Salcha, and Boondocks lie along the highway corridor.

The Richardson Highway was originally a pack trail used to transport supplies to the miners in Fairbanks and Eagle. It generally followed existing trade routes used by the natives. The trail was upgraded in 1910 to a wagon road by the Alaska Road Commission and was again upgraded to automobile standards in the 1920's. There were significant improvements made during World War II as part of the Alaska Highway construction including the construction of a bridge over the Tanana at Big Delta. The highway was paved in the 1950's. The highway was extensively realigned starting in the 1950s and continuing through the present day. The last major realignments took place after construction of the Trans Alaska Pipeline System. Sections of abandoned alignments can be observed on aerial photographs and maps, sometimes several in the same area. The highway alignment shown on the U. S. Geological Survey topographic maps show the approximate location of the highway at the time the map was prepared. However, in many places the road has since been realigned and the current alignment is not reflected on these maps.

2.2 General Geology

The portion of the Richardson Highway between Delta Junction and Fairbanks is located in the Lower Tanana Valley, situated between the relatively young and more rugged Alaska Range and the older, more subdued hills within the Yukon-Tanana Uplands. Large alluvial fans extend out from the north side of the Alaska Range pressing the Tanana River northeast up against the hills of the Yukon-Tanana Uplands. The Alaska Range is relatively young and there is significant erosion occurring. Large bed loads are transported out of the mountains and the rivers, for the most part, are aggrading, particularly the Delta River. Most active and inactive material sources along this stretch of the highway are on fluvial deposits and bedrock hills and ridges. There are a few small inactive sites in eolian dunes along the highway. However, there are extensive, thick deposits of loess and sand farther back in the hills to the northeast of the highway.

The hills along this portion of the Richardson Highway were not glaciated during the recent Pleistocene Epoch and thus weathered bedrock was not removed by glacial action to the extent it has been scoured in the Alaska Range. The bedrock primarily consists of older metamorphic schist and gneiss with younger granitic rock intruded into the metamorphic country rock. The granitic rock is generally composed of monzonite and granodiorite. With the exception of two sites at Tanana Bluffs, the bedrock is generally highly weathered to depths of more than 50 feet and should be proposed only for use as Type C embankment material. Types A and B material and aggregates should be obtained from fluvial sources in this area. Riprap production would likely require moving large amounts of weathered material to reach more competent rock in many of the sites.

The Tanana River is the most prominent feature along this section of the highway and is a major source of material. The river has a broad floodplain, over one mile wide in places. Due to the high bed loads within the river, the main channels shift relatively frequently with channel configurations changing significantly over decades. Thus, portions of DOT&PF material sites laid out in the 1960's or even the 1980's so as to be accessed without crossing the main channels have lost this access as the river shifted into them. Portions of the sites have become difficult to access today. The corollary of this is that areas previously inaccessible are now accessible. Thus, sites limits may have to be moved or adjusted every two decades or so.

The Delta River flows north out of the Alaska Range and is a major source of bed load for the Tanana River. The Salcha River flows west through the Yukon-Tanana Uplands to its confluence with the Tanana River near MP 325. It appears that the difference in bedrock weathering between the Alaska Range and the Yukon-Tanana Uplands may show up in aggregate quality testing results for the different floodplains. The material in the Delta River generally has Los Angles Abrasion losses of less than 30 while material tested in the Salcha River floodplain and related terraces had LA Abrasion test results ranging from 20 to 45.

Sites in the river floodplains are subject to spring and summer flooding that may fill the active floodplain from bank to bank with deep, fast moving water. These floods can be the result of spring runoff, heavy rains in Alaska Range or hot weather causing glacial melt to increase. Attempting to mine these sites during floods can be very difficult but it can be accomplished with extreme effort. Material should not be stockpiled in the active floodplains for extended periods of time. Flooding should be taken into consideration when placing screening and crushing plants in floodplains and equipment should not be stored there unattended.

As the alluvial fans push the Tanana River into the Yukon-Tanana Uplands, significant erosion is occurring along the eastern edge of the floodplain. Erosion rates averaging 10 feet per year have been noted in unconsolidated material and portions of the highway embankments have had to be heavily armored. There are a series of high, steep, bedrock bluffs along the river. In some places, the river appears to have cut back into the bedrock hills creating bedrock platforms underlying the floodplain at depths of approximately 20 to 35 feet. These platforms are particularly noticeable along the river between Banner Creek at MP 295 and Harding Lake. But they may also be found as far north as the Johnson Road area. North of the Johnson Road area, the highway pulls away from the hills and bedrock is typically greater than 50 feet below the surface.

This portion of the Richardson Highway lies on the north side of the Alaska Range. Therefore permafrost may be encountered anywhere along the alignment. Generally, permafrost ranges from isolated masses to discontinuous. Where permafrost occurs in fine-grained or organic soils, it may be ice-rich. Permafrost is generally absent under the active floodplain of the rivers, but may be present under some vegetated islands.

Groundwater is shallow in many of the material sites associated with the Tanana River floodplain and bailing operations are more common in this area than elsewhere in the state. Large drag lines and sauermans are commonly used to excavate sites in the Fairbanks area. The Delta River near Delta Junction may be a losing river for part of the year. Water levels in the winter have been observed to be lower than the summer.

Erosion caused by the Tanana River being thrust to the northeast toward the highway has created a significant demand for riprap. MS 62-3-157-2 and MS 62-3-157-2A are the only DOT&PF sites that have produced significant quantities of large riprap along this section of the Richardson Highway. There is also a commercial riprap site at Brown's Hill on Badger Road near North Pole. This site has supplied large amounts of rock for erosion control projects in the Fairbanks area. Long hauls are required from each of these sites for many of the areas requiring erosion control. DOT&PF also has large riprap sites on the Alaska Highway at MP 1392 (MS 62-3-075-2/Gerstle River Quarry) and on the Richardson Highway south of Delta Junction at MP 238 (MS (71-0-005-2/Donnelly Quarry) and MP 224.5 (MS 71-4-001-2/Lower Suzy Q Creek Quarry). Rock from these sites has been used along this stretch of the highway but requires even longer haul distances.

A potential riprap site was investigated on Flag Hill (62-4-180-2). The material was granitic bedrock but there is little known about the investigation. Other sites have been proposed or used as riprap sites, including MS 62-4-092-2 at the Salcha River and MS 62-4-162-2 at Moose Creek. However, these sites contained soft schist and gneiss with high waste factors, small maximum sizes, exhibited poor durability, and the sites were either never opened or are no longer in use.

2.3 Delta River Area (MP 266 to MP 275.5)

Between MP 266 (Delta Junction) and MP 275.5 (Tanana River Bridge), the highway traverses glaciofluvial deposits overlain by eolian silts and sands and parallels the active floodplain of the Delta River. There is an approximately 10-foot high bank along the active floodplain. Near MP 267, the highway crosses an abandoned floodplain of Jarvis Creek. There are low-lying fluvial terraces near the Delta River's confluence with the Tanana River. Generally, the glaciofluvial deposits along the highway are overlain by deep (>10-foot) eolian silts and there are presently no material sites in these deposits. A series of small sand dunes roughly paralleling the highway can be found in the vicinity of Tanana Loop Road. However, these sands are generally fine-grained and have not been mined to any significant extent. There are also several large active DOT&PF material sites to the east of the highway in the Remington – Jack Warren Road area. These are two to four miles from the Richardson Highway and access is along paved roads. Permafrost ranges from isolated masses to sporadic and is generally absent under active floodplains.

DOT&PF has one material site (MS 62-3-109-2) in the active floodplain of the Delta River. Alyeska used this site during pipeline construction producing significant quantities of material, including pipe bedding material. Excavation in the floodplain has the potential to divert channels, causing bank erosion along Spangler Road and setbacks from the bank may be required.

The river channels shift regularly and water levels can change rapidly. Diversion berms are required to keep water from flowing through excavations. These berms typically require ongoing maintenance during mining operations. Material should not be stockpiled in the active floodplain if the berms cannot be maintained. The Delta River is an aggrading river and excavated areas are typically naturally backfilled and reclaimed within several years.

There is little overburden overlying the abandoned Jarvis Creek floodplain near MP 267. However, the area is extensively developed and there is an airstrip on the east side of the highway. DOT&PF had three small sites on the floodplain near the Delta River but they were closed due to erosion concerns.

There are a series of low-lying fluvial terraces at the confluence of the Delta and Tanana Rivers that contain material similar to that found in the active floodplain with typically less than 3 feet of overburden. Several small pits have been excavated in this terrace and DOT&PF has an active material site located there (MS 62-3-112-2). Groundwater levels vary significantly in this area, typically deeper in the winter and shallower in the spring and summer. Pits have been excavated "in the dry" during the winter, only to flood during the spring.

Degradation values for the alluvial and glaciofluvial sands and gravels were generally greater than 50 and the Los Angeles Abrasion loss less than 30 percent. These test results indicate that material for producing crushed aggregates is available from this area.

2.4 Tanana Bluffs (MP 275.5 to MP 276.5)

The Tanana Bluffs consist of a high bedrock ridge along the north side of the Tanana River near Big Delta, covered by deep deposits of eolian silt. The highway crosses the west end of the ridge where DOT&PF presently has a cluster of five sites. DOT&PF has purchased some of these properties. At least two of these properties appear to have been acquired for overburden storage. The rock is predominately gneiss and schist. Weathering penetration is variable, being highly weathered from 5 to more than 20 feet in depth. Permafrost on the ridge is discontinuous.

There are two active sites on the large knob overlooking the river. MS 62-3-052-2 is a small site near the highway bridge, apparently acquired so that the rubble at the bottom of the cliffs could be excavated. MS 62-3-122-2 is the largest site in this group. Drilling in 1990 found between 20 and 45 feet of ice-rich silt overlying the bedrock. That finding, coupled with restrictions to mining along the bluff due to bird habitat and visual impact, make using this site unlikely.

A second complex of sites, referred to as the Gilbertson Quarries (MS 62-3-122-2A and MS 62-3-157-2), are located between the highway and the Tanana River. There is a small quarry in MS 62-3-157-2 that has filled with water. The water appeared to be about 10 to 15 feet deep. The southern portion of MS 62-3-122-2A was apparently acquired for processing and overburden stockpiling areas. There appears to be a narrow bench of bedrock overlain by deep silt between the existing pit and the north end of the sites. A river terrace in the northern portion of MS 62-3-122-2A may contain some useable material, although some junked cars would need to be removed.

MS 62-157-2A is a large quarry on the east side of the highway. It has been mined for riprap in the past and there is a deep "glory hole" in the site (>80 feet). The site reportedly produced Class I, II, and III riprap with approx. 80 percent waste rock. The quality and size of riprap produced reportedly increased with depth. Overburden consists of silt typically ranging from 10 to 20 feet deep. There is a small piece of property within the northwest corner of MS 62-3-157-2A that appears to have 20 to 40 feet of silt and waste rock stockpiled on it. This site appears to have the potential to produce large amounts of material, including riprap, if the overburden can be removed and stockpiled out of the way. This is the only DOT&PF site successfully used for riprap production between Delta Junction and Fairbanks. The next closest site to the north is Brown's Hill Quarry near North Pole.

Degradation values in the bedrock ranged from 8 to 51 and the Los Angeles Abrasion loss ranged from 44 to 48 percent. These test results indicate that with some selective mining, material for producing crushed aggregates is available from these sites.

2.5 Shaw Creek Flats (MP 276.5 to MP 287)

Between MP 276.5 (Tanana River Bluffs) and MP 287 (Shaw Creek), the highway parallels the active floodplain of the Tanana River on a high level terrace. The terrace is 10 to 15 feet above the floodplain. The fluvial terrace is generally continuously frozen and overlain by ice-rich silt covered by wetlands, including peat bogs and marshes. The Tanana River is being pushed to the northeast in this area by the large alluvial fans along the north side of the Alaska Range. There is significant bank erosion occurring along the eastern edge of the floodplain, in places appearing to average about 10 feet per year.

The Tanana River floodplain consists of meandering river channels and both vegetated and unvegetated sand and gravel bars. These river channels shift often. This causes sites laid out so as large river channels do not have to be crossed, to eventually be cut by those channels as they shift. Thus, portions of the site are left on the far side of the river channels from the highway. Conversely, other areas become accessible. This appears to be the reason why much of the existing DOT&PF sites are cut off by main channels. It may be necessary to move the sites every 20 years or so to allow access. Mining activity can also influence channel shifts as at MS 62-4-166-2/Alyeska MS 49-1. Hydrology studies should be performed for these sites prior to mining activities.

During periods of high water, much of the active floodplain is underwater and many of the vegetated islands are cut off from the bank. Many sites that have been mined apparently restore themselves naturally. Excavations fill in and disturbed areas revegetate relatively quickly. An example of this is the area between MS 62-3-003-2 and the highway which was mined in the 1970's. It is difficult today to even tell it was excavated, as the area is almost completely filled in and revegetated.

Low-lying terraces are found along the edge of the floodplain. These are typically one to 4 feet above the floodplain. Aerial photos indicate that they are in areas from which the main channels of the river have shifted. There have been several sites placed on these low terraces, but with the exception of MS 62-4-166-2, they have not been worked for many years.

The higher terrace over which the highway crosses is typically covered with 5 to 15 feet of ice-rich silt. Pits excavated on this terrace have filled with water. Many of the active and inactive DOT&PF material sites laid out on this terrace in the 1960's have either dropped into the active floodplain, or appear to be in the process of doing so. Mining in the area between the floodplain and the highway has the potential to accelerate the rate of bank erosion and should be avoided, where possible. Over the long run, it may be more feasible to mine the area on the side of the highway away from the river to the east. Hydrologic analysis should be performed prior to any mining operations in these areas.

There are five DOT&PF active material sites presently in this section and 15 inactive sites. Two laboratory tests gave Los Angeles Abrasion losses of 24 percent. There were no degradation values found in the files.

2.6 Shaw Creek to Canyon Creek Area (MP 287 to MP 300)

Between MP 287 (Shaw Creek) and MP 300 (confluence of Canyon Creek), the highway alignment generally follows the east side of the Tanana River floodplain, except where it climbs through the Tenderfoot Creek Valley from MP 289 through MP 294. DOT&PF material sites in this segment have included sites both in fluvial sand and gravel and in bedrock. Permafrost ranges from sporadic to discontinuous, generally being absent under the active floodplain.

The fluvial sites are generally large, but several are constrained in depth due to relatively shallow bedrock underlying the floodplain. Main channels of the river have shifted into several of the active sites and parts of these sites are accessible only with difficulty. This includes MS 62-4-102-2, MS 62-4-103-2 and MS 62-4-104-2 near Banner Creek. Bedrock at depths ranging from 20 to 35 feet can be anticipated at these sites.

Most of the bedrock sites have been closed. Only MS 62-4-160-2 (undeveloped) and MS 62-4-165-2 are still active. The bedrock consists of schist and gneiss, generally composed of alternating layers of soft degradable micaceous material and hard brittle quartzite. The bedrock is generally highly weathered to depths of 50 feet or greater and should be proposed for use only as Type C embankment material. Types A and B material and aggregates should be obtained from fluvial sources in this area. Riprap production would likely require moving large amounts of weathered material to reach more competent rock.

Degradation values for the fluvial gravels were generally greater than 60 and the Los Angeles Abrasion losses ranged from 25 to 50 percent. These test results indicate that fluvial material for producing crushed aggregates may be available in this area. Samples of the schist bedrock had degradation values ranging from 3 to 73 and Los Angeles Abrasion losses ranging from 20 to 60 percent. Aggregate production from this bedrock would be problematic.

2.7 Birch Lake Area (MP 300 to MP 310)

Between MP 300 (confluence of Canyon Creek and Tanana River) and MP 310, the highway alignment moves inland from the east side of the Tanana River floodplain, traversing low bedrock hills and crossing around Birch Lake. All but two of the seven active and inactive DOT&PF material sites in this area are in granitic bedrock. MS 62-4-155-2 was a peat source. MS 62-4-061-2 was on a fluvial terrace of the Tanana River. Permafrost is sporadic to discontinuous with ice-rich silt and organics in low areas surrounding Birch Lake.

The fluvial terrace lies west of Birch Lake and appears to be a high level terrace of the Tanana River (~25 feet above the floodplain). The terrace appears to parallel the Tanana River from Chisholm Lake to MP 308.5. The sites are covered with 3 to 8 feet of overburden. Los Angeles Abrasion losses ranged from 25 to 40 percent and indicate that producing crushed aggregates from the fluvial material may be feasible.

Bedrock consists of granitic rock, generally composed of monzonite and granodiorite. The rock is highly weathered with the weathering appearing to extend to depths of 25 feet or greater. Large "core stones" may also be present. Degradation values for the bedrock were generally less than 10 and Los Angeles Abrasion losses greater than 30 percent. These test results indicate that producing crushed aggregates from the bedrock may not be feasible in this area. The highly weathered bedrock should be proposed for use only as Type C embankment material. Types A and B material and aggregates should be obtained from fluvial sources. Riprap production would likely require moving excessive amounts of weathered material to reach more competent rock.

2.8 Midway Lodge Area (MP 310 to MP 320)

Between MP 310 and MP 320 (Harding Lake), the highway alignment generally follows along the east side of the Tanana River, adjacent to a series of low bedrock hills and ridges. Soils consist of fluvial sand and gravel with cobbles and boulders on the floodplain and associated terraces. The bedrock underlying the hills consists of gneiss and granitic bedrock. Permafrost is sporadic to discontinuous, but is generally absent under the floodplain.

Generally, the fluvial sand and gravel units are overlain by a layer of silt and organics ranging from 2 to 4 feet thick (>4 feet in infilled channels). The highway is adjacent to the floodplain of the Tanana River between MP 311 and MP 313.5. DOT&PF has one active material site (MS 62-4-148-2) in the floodplain. Refusal on bedrock or boulders was reported at approximately 20 feet below the surface. Much of this site is presently on the far side of a large channel from the highway.

There are also fluvial deposits on two terrace surfaces between MP 313.5 (Silver Fox Lodge) and MP 318. The lower surface is approximately 5 to 10 feet high and is found from approximately MP 315 to 318. Material Sites MS 62-4-033-2 and MS 62-4-096-2 are located on a higher terrace surface approximately 30 to 40 feet above the present floodplain.

Bedrock consists of metamorphic schist and gneiss intruded by granitic rocks. The granitic rock is composed of monzonite and granodiorite. Both rock types are generally highly weathered and not suitable for aggregate or riprap production. The granitic rock at the west end of Flag Hill was evaluated for riprap production, but there is little known about the investigation. Generally, the bedrock is highly weathered to depths of more than 25 feet and should be proposed only for use as Type C embankment material. Types A and B material and aggregates should be obtained from fluvial sources in this area. Riprap production would likely require moving large amounts of weathered bedrock to reach more competent rock.

Degradation values for the alluvial gravels were generally greater than 70 and the Los Angeles Abrasion loss less than 30 percent. These test results indicate that material for producing crushed aggregates is available in this area. There were no test results for the bedrock in this area.

2.9 Salcha River – Harding Lake Area (MP 320 to MP 325)

Between MP 320 (Hartman Lake) and MP 325 (Salcha River Bridge), the Richardson Highway crosses fluvial terraces and then the floodplain of the Salcha River. The terrace scarp occurs at approximately MP 322 and the terraces lie to the south. DOT&PF has three active material sites and seven inactive sites along this portion of the alignment. The deposits consist of sand and gravel with 3 to 9 feet of overburden. Permafrost in the area ranges from sporadic to discontinuous. Groundwater tables are generally shallow under the Salcha River floodplain and deeper under the terraces (~30 feet).

Los Angeles Abrasion losses for the fluvial sand and gravel generally ranged from 30 to 45 percent. These test results indicate that material for producing crushed aggregates may be available in this area. There were no degradation values found for this section of the alignment.

2.10 Little Salcha River – Johnson Road Area (MP 325 to MP 332)

Between MP 325 (Salcha River Bridge) and MP 332 (Grieme Road), the highway follows the Salcha and Tanana Rivers crossing the Little Salcha River on floodplain deposits. It traverses around the ends of two bedrock ridges that parallel both sides of the Little Salcha River. In places, it is hard up against the bedrock bluffs at the end of the ridges. Materials in the floodplain consist of sand and gravel overlain by varying depths of silt. DOT&PF has four active material sites along this portion of the highway, three in floodplain deposits and one on the bedrock ridge at MP 329. Permafrost is sporadic to discontinuous in upland areas and in isolated pockets or absent under the floodplain.

Most of available floodplain deposits lie on relatively low vegetated terraces along the Tanana and Salcha Rivers. Overburden generally consists of less than 3 feet of silt overlying sand and gravel. Mining in the active floodplain of the Tanana and Salcha Rivers would be subject to flooding during periods of high flow, which would make excavation difficult. Bedrock may be encountered at depths of less than 50 feet under the floodplain. Erosion of highway embankments is a major problem along this portion of the Richardson Highway. Hydrology studies should be performed to minimize the potential for increasing erosion, when locating material sites on the floodplain.

Inactive Material Site MS 62-4-016-2 was located on a higher terrace of the Tanana River along the east side of the highway. Mining on this side of the highway would have the advantage of minimizing the potential for increasing erosion along the highway embankment. Other potential sand and gravel deposits may be found in this area. However, they will typically be covered by thick ice-rich silt and perennially frozen unless the surface has been disturbed.

Bedrock underlying the two ridges within this segment of the alignment consists of schist which generally ranges from completely to highly weathered for depths of 50 feet or greater. MS 62-4-015-2 is the only active DOT&PF bedrock quarry in this area. It is apparently undeveloped, but there is a small existing pit adjacent to the site. There is an existing privately owned quarry on Balch Road at MP 328. In 1995, the Balch Quarry was used for the production of riprap for an erosion control project in this area, but it was abandoned due to the poor quality of the rock. Rock was then obtained from MS 62-3-157-2A at MP 276.5. DOT&PF has also reportedly obtained riprap from MS 62-4-092-2 adjacent to the Salcha River Bridge. However, the rock in the Salcha site was deemed of too poor a quality for this type of use in 1996. The bedrock is generally too highly weathered and should be proposed for use only as Type C embankment material. Types A and B material and aggregates should be obtained from fluvial sources in this area.

Los Angeles Abrasion losses for the fluvial sand and gravel are generally less than 30 percent. These test results indicate that material for producing crushed aggregates may be available in this area. There were no degradation values found for this section of the alignment.

2.11 Eielson AFB to Fairbanks (MP 332 to MP 362)

Between MP 332 (Grieme Road) and MP 362 (intersection with Steese Highway and Airport Road), the highway crosses terraces and abandoned floodplains of the Tanana River. DOT&PF has only two remaining sites in this area. MS 62-4-085-2 lies within the Moose Creek Flood Control Project and is probably not useable. MS 62-4-084-2 has been worked to a depth of approximately 20 feet or more over its entire area. It would likely be minable only by a sauerman. In the past there was a large material site in the active Tanana River floodplain near Fairbanks. There is sporadic to discontinuous permafrost on the terraces and abandoned floodplains. Permafrost is generally absent under the active floodplain of the Tanana River. High water tables will be encountered in the unfrozen areas. Most of the sites in this area require bailing or dewatering.

There has been extensive development in the area and, with the exception of the military reservations, land for gravel extraction is becoming more difficult to find. There are commercial gravel sources in this area and DOT&PF has reportedly obtained all of its material from these commercial sources in the recent past. There is probably no reason for DOT&PF to obtain additional sites in this area for the foreseeable future. As time goes on, and land prices escalate, it may not be economical to mine gravel in the area. At that time gravel may have to be imported from a great distance as is presently being done in Anchorage. DOT&PF in conjunction with the North Star Borough may consider creating gravel reserves for future use.

Degradation test results were not found for this area. Los Angeles Abrasion losses were generally less than 30 percent. These test results indicate that material for producing crushed aggregates is available in this area.

3.0 LAND USE PLANNING – TANANA BASIN AREA PLAN

State lands along the Richardson Highway between Delta Junction and Fairbanks are being managed by the State of Alaska Department of Natural Resources (DNR) under the Tanana Basin Area Plan adopted in 1985 and updated in 1991 (Subregions 1 and 7). DNR is presently in the process of separating the Tanana Basin Area Plan into the Yukon – Tanana Area Plan and the Eastern Tanana Area Plan. This portion of the Richardson Highway would lie within the Eastern Tanana planning area when the new plan is adopted. The complete plan and information about the new plan revisions are available on the internet at the following address:

http://www.dnr.state.ak.us/mlw/planning/areaplans/tanana/index.cfm

The introduction to the Tanana Basin Area Plan states that "The plan designates the uses that will occur on state lands within the Tanana Basin. It shows areas to be sold for private use and area to be retained in state ownership. It does not direct land uses for private, borough, or federal land, nor does it direct land uses for areas already legislatively designated for specific purposes, such as parks or wildlife refuges."

The section on Materials in Chapter 2: Goals of the Plan, list one of the goals of the plan as "Maintain in state ownership and make available to public and private users sufficient, suitably located material sites to economically meet the area's long term need for materials.

The following are the Management Guidelines:

> **A. Preferred Material Sites.** When responding to a request for a material sale or identifying a source for material, the highest priority should be to use existing material sources. Using materials from wetlands and lakes should be avoided unless no feasible alternative exists. Sales or permits for sand, silt, or gravel extraction will not be permitted in fish spawning areas identified by DF&G unless extraction would enhance the site for rearing and DF&G determines that the activity is compatible with fish habitat values.
>
> **B. Material Sites.** To minimize the construction and maintenance cost of transportation facilities, material sites should be located as near as is feasible to the site where the material will be used.
>
> Design of projects will be on a case by case basis in consultation with other agencies. The following are general guidelines for extracting materials:
>
> > **1. Material Sources.** Consideration should be given to all potential material sources. Location and design of sites should take into account factors such as scenic quality, transportation to the site, and effects to fish and wildlife habitat.
> >
> > **2. River Size and Recharge Rates.** Selection of gravel sites in floodplains should take into account the volume of gravel available

from various stream types. Generally, the largest river feasible, or the one with the largest gravel recharge rates should be chose.

3. Reclamation. Reclamation of material sites will be accomplished consistent with AS 17.15.

4. Extraction from Active Channels. When extracting gravel in active or inactive floodplains, maintain buffers that will minimize sedimentation and will contain active channels in their original locations and configurations in the short term.

C. Maintaining Other Uses and Resources when Siting and Operating Material Sites. Before allowing the extraction of materials, the manager will ensure that the requirements of the permit or lease give adequate protection to other important resources and uses including existing water rights, water resource quantity and quality, navigation, fish and wildlife habitat and harvest, commercial forest resources, recreation resources and opportunities, historic and archaeological resources, adjacent land uses, and access to public or private lands. Disposal of materials should be consistent with the applicable management intent statement and management guidelines of the plan.

The manager should also determine if other existing material sites can be vacated and rehabilitated as a result of opening a new material site.

D. Screening and Rehabilitation. Material sites should be screened from roads, residential areas, recreational areas, and other areas of significant human use. Sufficient land should be allocated to the material site to allow for such screening. Where appropriate, rehabilitation of material sites will be required. For additional guidelines affecting material extraction see policies under the subsurface resources section.

E. Other Guidelines Affecting Materials. Other guidelines may affect materials. See in particular the following sections of this chapter:

- Fish and Wildlife Habitat and Harvest
- Settlement
- Subsurface Resources
- Transportation”

4.0 RELEVENT PUBLICATIONS

The following is a list of publications that may be useful for understanding the geology and material sources along the Richardson Highway corridor between Delta Junction and Fairbanks. Note: references including a single quadrangle appear under the respective quadrangle listing; references including each of the two quadrangles appear in the "alignment-wide" section.

Big Delta Quadrangle

Foster, H.L., Dusel-Bacon, Cynthia, and Weber, F.R., 1977, Reconnaissance geologic map of the Big Delta C-4 Quadrangle, Alaska: U.S. Geological Survey Open-File Report 77-262, 1 sheet, scale

Reger, R.D., and Pewe, T.L., 2002, Geologic map of the Big Delta A-4 Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys Report of Investigation 2002-2, 1 sheet, scale 1:63,360.

Reger, R.D., Stevens, D.S.P., and Solie, D.N., 2008, Surficial geology of the Alaska highway corridor, Delta Junction to Dot Lake: Alaska Division of Geological & Geophysical Survey Preliminary Interpretive Report 2008-3a, 48 p., 2 sheets, scale 1:63,360.

Reger, R.D., and Solie, D.N., 2008, Engineering-geologic map, Alaska highway corridor, Delta Junction to Dot Lake, Alaska: Alaska Division of Geological & Geophysical Survey Preliminary Interpretive Report 2008-3b, 2 sheets, scale 1:63,360.

Reger, R.D., and Solie, D.N., 2008, Reconnaissance interpretation of permafrost, Alaska highway corridor, Delta Junction to Dot Lake, Alaska: Alaska Division of Geological & Geophysical Survey Preliminary Interpretive Report 2008-3c, 10 p., 2 sheets, scale 1:63,360.

Weber, F. R., 1971, Preliminary engineering geologic maps of the proposed Trans-Alaska Pipeline route, Fairbanks and Big Delta quadrangles: U.S. Geological Survey Open-File Report 71-317, 2 maps, scale 1:125,000.

Weber, F.R., Foster, H.L., and Keith, T.E.C., 1977, Reconnaissance geologic map of the Big Delta A-2 and A-3 quadrangles, Alaska: U.S. Geological Survey Miscellaneous Field Studies 869, 1 sheet, scale 1:63,360.

Weber, F.R., Foster, H.L., Keith, T.E.C., and Dusel-Bacon, Cynthia, 1978, Preliminary geologic map of the Big Delta Quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-529-A, 1 sheet, scale 1:250,000.

Fairbanks Quadrangle

Alaska Division of Geological & Geophysical Surveys, Management Resource Mapping Program: Photo interpretive landform map of the Fairbanks Quadrangle, 1982, Prepared by R.A. Kreig & Associates, Inc., 1 map, scale 1:250,000.

Péwé, T.L., 1958, Fairbanks D-2, Alaska geology: U.S. Geological Survey Geologic Quadrangle Map GQ-110, 1 map, scale 1:63,360.

Péwé, T. L., and Bell, J. W., 1975, Map showing construction materials in the Fairbanks D-2 NE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map 670-C, 1 map, scale 1:24,000.

Péwé, T. L., and Bell, J. W., 1975, Map showing construction materials in the Fairbanks D-2 SE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map 669-C, 1map, scale 1:24,000.

Péwé, T. L., and Bell, J. W., 1975, Map showing distribution of permafrost in the Fairbanks D-1 SW Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map 671-A, 1 map, scale 1:24,000.

Péwé, T. L., and Bell, J. W., 1975, Map showing distribution of permafrost in the Fairbanks D-2 NE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map 670-A, 1 map, scale 1:24,000.

Péwé, T. L., and Bell, J. W., 1975, Map showing distribution of permafrost in the Fairbanks D-2 SE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map 669-A, 1 map, scale 1:24,000.

Péwé, T. L., and Bell, J. W., 1975, Map showing ground-water conditions in the Fairbanks D-2 SE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map 669-B, 1 map, scale 1:24,000.

Péwé, T. L., Bell, J. W., Forbes, R. B., and Weber, F. R., 1977, Geologic map of the Fairbanks D-2 NE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Map I-950, 1 map, scale 1:24,000.

Péwé, T. L., Bell, J. W., Forbes, R. B., and Weber, R. B., 1976, Geologic map of the Fairbanks D-2 SE Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Series 942, 1 map, scale 1:24,000.

Péwé, T. L., Wahrhaftig, Clyde, and Weber, F. R., 1966, Geologic map of the Fairbanks Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations 455, 1 map, scale 1:250,000.

Robinson, M.S., Smith, T.E., and Metz, P.A., 1990, Bedrock geology of the Fairbanks Mining District: Alaska Division of Geological & Geophysical Surveys Professional Report 106, 2 sheets, scale 1:63,360.

Weber, F. R., 1971, Preliminary engineering geologic maps of the proposed Trans-Alaska Pipeline route, Fairbanks and Big Delta quadrangles: U.S. Geological Survey Open-File Report 71-317, 2 sheets, 1 map, scale 1:125,000.

Alignment-wide

Brown, J., Ferrians, O. J., Heginbottom, J. A., and Melnikov, E. S., 1997, Circum-Arctic map of permafrost and ground-ice conditions: U.S. Geological Survey Circum-Pacific Map, 1 map, scale 1:10,000,000.

Carter, L.D., and Galloway, J.P., 1978, Preliminary engineering geologic maps of the proposed natural gas pipeline route in the Tanana River valley, Alaska: U.S. Geological Survey Open-File Report 78-794, 26 p., 3 sheets, scale 1:125,000.

Cameron, C.E. (comp.), Thomas, E.E. (comp.), and Galló, C.A. (comp.), 2002, Engineering-geologic database of the proposed Alaska Natural Gas Transportation System (ANGTS) corridor, from Prudhoe Bay to Delta Junction, Alaska [CD-ROM]: State of Alaska, Department of Natural Resources, Division of Geological & Geophysical Surveys, Fairbanks, Alaska, Miscellaneous Publication 125.

Coulter, H. W., Hopkins, D. M., Karlstrom, T. N. V., Péwé, T. L., Wahrhaftig, C., and Williams, J. R., 1965, Map showing extent of glaciations in Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-415, 1 map, scale 1:2,500,000.

Ferrians, O. J. (comp.), 1965, Permafrost map of Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-445, 1 map, scale 1:2,500,000.

Foster, H.L., comp., 1992, Geologic map of the eastern Yukon-Tanana region, Alaska: U.S. Geological Survey Open-File Report 92-313, 26 p., 1 sheet, scale 1:500,000.

Foster, H.L., Keith, T.E.C., and Menzie, W.D., 1987, Geology of east-central Alaska: U.S. Geological Survey Open-File Report 87-188.

Gallant, A. L., Binnian, E. F., Omernik, J. M., and Shasby, M. B.,1995, Ecoregions of Alaska: U.S. Geological Survey Professional Paper Report Number 1567, 73 p. 1 map, scale 1:5,000,000.

Karlstrom , T.N.V., et al., 1964, Surficial geology of Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-357, scale 1:584,000.

Kreig, R.A., and Reger, R.D., 1982, Air-photo analysis and summary of landform soil properties along the route of the Trans-Alaska Pipeline System: Alaska Division of Geological & Geophysical Surveys, Geologic Report 66, 149 p.

Péwé, T.L., Burbank, Lawrence, and Mayo, L. R., 1967, Multiple glaciation of the Yukon-Tanana Upland, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I- 507, 1 map, scale 1:500,000.

Péwé, T.L., 1975, Quaternary geology of Alaska: U.S. Geological Survey Professional Paper 835, 145 p., 3 plates.

Péwé, T.L., and Reger, R.D.(editors), 1983, Richardson and Glenn Highways, Alaska, guidebook to permafrost and Quaternary geology: Alaska Division of Geological & Geophysical Surveys, Guidebook 1, 263 p.

Reger, R. D., 1987, Survey of the sand-and-gravel potential of legislatively designated replacement pool lands in Alaska: Alaska Division of Geological & Geophysical Surveys Public Data File 88-2, 18 p, 227 sheets, scale 1:63,360.